Insights in Assessing Telepsychiatry in Rural North Carolina Emergency Departments

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A master's paper submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Science in Public Health in the Department of Health Policy and Management, Gillings School of Global Public Health

Chapel Hill
May 4th, 2018

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Abstract

Objective
The purpose of this study is to assess beliefs on the effects of telepsychiatry on the process of care and outcomes for patients, whether current data are suited to assessing the North Carolina Statewide Telepsychiatry Program, and providing next steps for the program's evaluation.

Methods
Through conversations with stakeholders, literature review and analysis of NC-STeP presentations, information was drawn to build a process flow diagram. The process flow diagram was used to create a framework for assessing the program in the future.

Results
The results show that while NC-STeP claims to have improved patient measures like length of stay and involuntary commitments, there is a gap in data to study the efficacy and cost savings of the program.

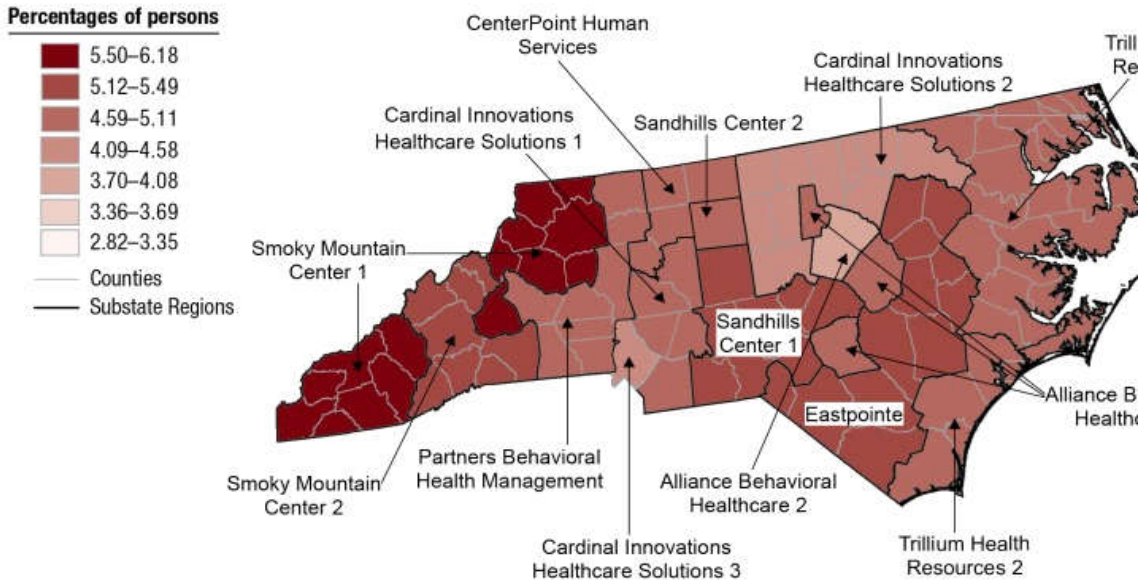
Conclusion
With a refined process flow diagram and improved data, we can use simulation modeling techniques like queuing to understand the costs and benefits of NC-STeP. Telehealth interventions are only growing in the modern approach to urban-rural disparities, making assessment increasingly important.

Background

According to the National Institute of Mental Health, as of 2015, there are approximately

43.4 million or 17.9% of United States adults living with mental illness (1). In North Carolina, there are approximately 600,000 adults with a mental illness (2). Approximately 5% of rural residents in North Carolina have a severe mental illness or substance use disorder (3). In addition to a higher prevalence with relation to the population size and having a psychiatric provider shortage, those living in rural communities are more likely to be older, have lower incomes, higher rates of unemployment, higher mortality rates, higher rates of uninsured or underinsurance, live near hospitals with poorer infrastructure, lack of transportation, experience mental health stigma and lack the anonymity to comfortably receive treatment (4,5).

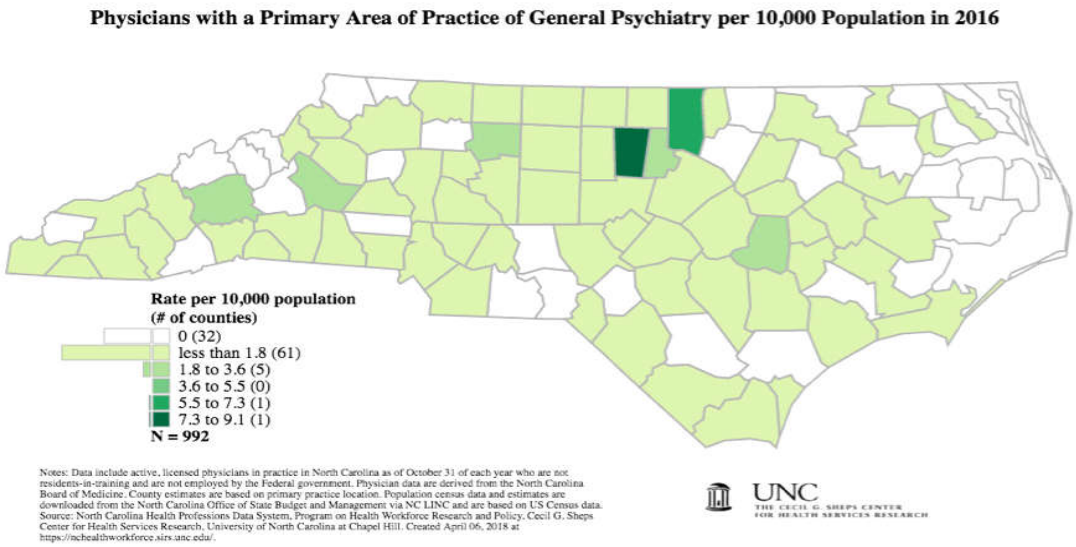
Figure 1. Prevalence of North Carolinians with Severe Mental Illness and Substance Use Disorder



In rural North Carolina communities, there are fewer providers compared to urban communities who are trained to provide behavioral health services (7). More specifically, out of 100 North Carolina counties, 32 counties have do not have any psychiatrists (figure 2) and 35 counties are designated as Mental Health Professional Shortage Areas (HPSAs) (6,7). As evident in figures 1 and 2,

North Carolina suffers from a mismatch between the supply of psychiatrists and their need in rural communities. This is consistent with trends showing that providers and especially specialists are generally concentrated in urban centers. In North Carolina, this is especially clear in Western and Eastern parts of the state that are not near large urban centers and have a much smaller number of psychiatrists.

Figure 2. Physicians with a Primary Area of Practice of General Psychiatry in 2016



The combination of provider maldistribution leading to shortages and socioeconomic barriers are most felt in rural emergency departments. A study assessing rural utilization of the emergency department (ED) for mental health (MH) and substance abuse (SA) at a national level, found in 2013 that “14.6% of all ED visits were for a primary MH or SA diagnosis” (8). The effects are felt most in the form of increased length of stay in the emergency department, utilization of

emergency department resources, higher costs, less efficient patient throughput and a less rehabilitative experience for the patient as rural EDs do not have the resources to meet the need. This is especially true for patients who are being held under an involuntary commitment order (IVC). For some with Severe Mental Illness and Substance Use Disorders, an unfortunate reality is that at some point they may become a danger to themselves or to others to the point of prompting a legal order to ensure the patient receives care. According to the National Alliance on Mental Illness “about half of the time the involuntary commitment papers are begun by emergency department physicians after a family member, EMS worker, or law enforcement officer brings the patient to the emergency department.” (9). A patient under this type of order has to be examined by a physician or psychologist for the determination of commitment type. Commitment types include inpatient, outpatient, substance abuse, or the commitment can be terminated (10). State-operated psychiatric hospitals do not have sufficient bed space, then resulting in a backlog of involuntarily committed patients waiting in community hospital emergency rooms for several days. With the prevalence of mental illness in North Carolina, continued access barriers to visit mental health professionals, and the percentage of patients presenting to the ED for mental health or substance abuse crisis, an innovative solution addressing rural psychiatric needs is paramount.

The North Carolina Statewide Telepsychiatry Program (NC-STeP)

In response to psychiatric disparities in the state, in 2013 the NC General assembly (NCGA) directed the North Carolina Office of Rural Health to create a

plan for a Statewide Telepsychiatry program. The East Carolina University Center for Telepsychiatry and E-behavioral health was selected by the NCGA to implement, oversee and monitor the program. With that direction, they created a hub and spoke model with 53 sites receiving consultation from 7 provider hubs (15 sites waiting to go live). A map of this statewide system and a list of participating hospitals can be found in the appendix. NC-STeP enables telepsychiatry services so that patients experiencing an acute mental health or substance abuse crisis can receive the psychiatric care they need in a timely manner. For the purposes of this program, telepsychiatry is defined as “the delivery of acute mental health or substance abuse care, including diagnosis or treatment, by means of two-way real-time interactive audio and video by a consulting provider at a consultant site to an individual patient at a referring site” (11). Videoconferencing is facilitated using mobile carts and desktop units that are moved into the patient’s room for a psychiatric consultation. A web portal has been designed and implemented that combines scheduling, electronic medical records, health information exchange functions, and data management systems to improve the efficiency and ease of providing services. To measure the program’s efficacy, NC-STeP’s primary measures are number of psychiatric assessments, a patient’s length of stay in the emergency department and the number of overturned involuntary commitments.

Today, the program boasts 28,853 psychiatry assessments since program inception, and approximately 30% of the patients it serves are uninsured (12). Considering the growth of telehealth as a method to lessen access disparities in

rural communities, the use of telepsychiatry in North Carolina for this purpose, and the potential for future investment from the state government, it is essential that the state have evidence that this intervention's benefits both improve care for patients and outweigh its costs. Currently there is a gap in available information about the costs and benefits associated with this program. The purpose of this analysis is to address this knowledge gap in providing insights to the process of assessing telemedicine efforts in rural emergency departments, especially those focused on addressing psychiatry.

Significance

This analysis provides a framework for modeling complex interventions to provide a basis for future analyses. Through this research, we have identified gaps in the literature and data that are necessary to assess the costs and benefits of telepsychiatry programs in rural communities like the North Carolina Statewide Telepsychiatry program.

Research Aims

This paper will address the following questions:

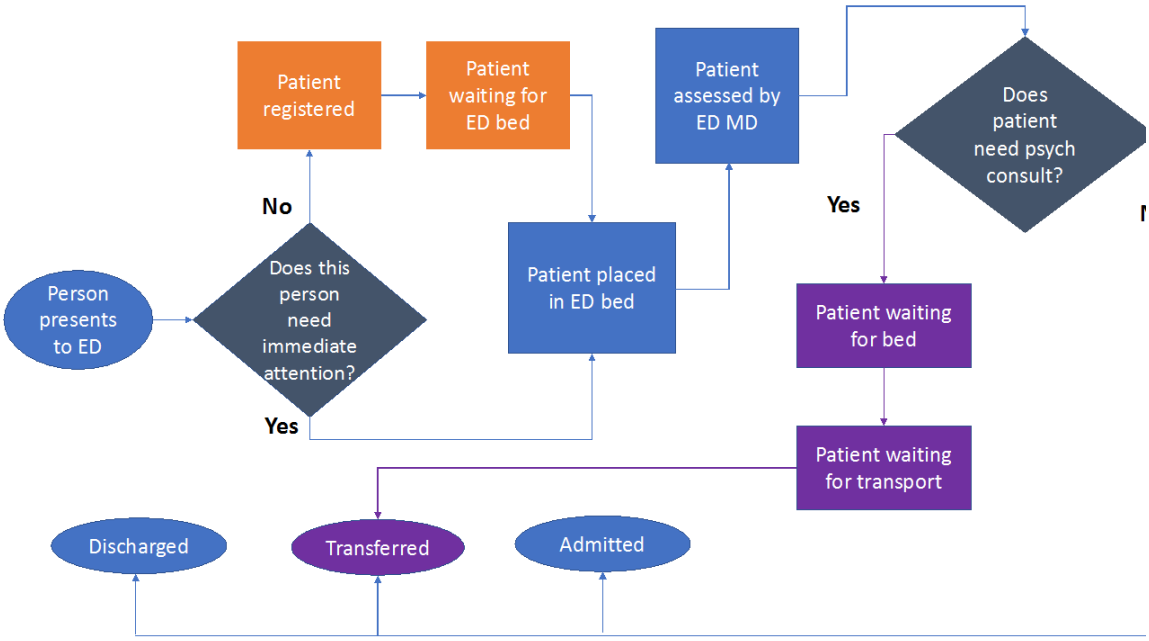
- How do stakeholders believe telepsychiatry affects the processes of care and outcomes for patients with severe mental illness and/or substance use disorders in rural North Carolina?
- How well is current data suited for answering this question?
- What are some recommendations and next steps for analysis?

After further exploration of these questions and the modeling techniques that

could be useful in assessing the program's costs and benefits, it was determined that to assess the program to answer these questions, a non-linear model was needed.

To understand what kind of model would best suit this analysis, first the process patients experiencing an acute mental health or substance abuse crisis needed to be understood. The figures below are process flow diagrams that we created through conversations with NC-STeP administrators, a hospital administrator, a mental health researcher, a local health department director, and review of the literature. These diagrams depict the pathway a person experiencing an acute mental health crisis would have taken prior to the implementation (figure 3) and after the implementation (figure 4) of NC-SteP. For the purposes of this analysis, an acute mental health crisis is one where a person is experiencing distress due to mental illness and/or a substance use disorder requiring immediate care.

Figure 3. A patient's flow through the ED Prior to the Implementation of NC-STeP



Psychiatric care in the emergency department prior to NC-STeP implementation

Prior to the implementation of NC-STeP, patients presented to the emergency room either for a crisis that requires immediate attention or not. This patient divide can be seen in the diamond shape that says “does this person need immediate attention?” For those needing immediate attention, they would be admitted to the emergency department and placed in an ED bed to be seen by an ED physician. This path is the most likely path for patients suffering from an acute mental health or substance abuse crisis. However, for patients that present that do not require immediate attention, they would be registered and would have to wait to be admitted and placed in an ED bed. After patients are placed in the

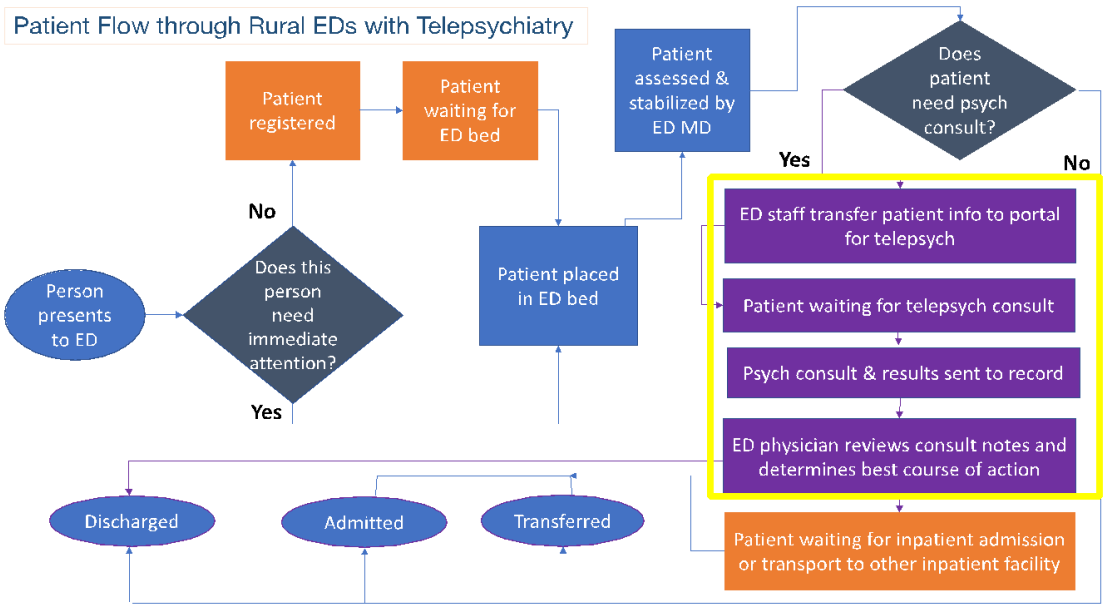
ED bed, a physician will assess them and determine if they require a psychiatric consult. All of the emergency departments participating in NC-STeP did not have access to psychiatric services prior to the program. With the psychiatric shortages in these communities, it is highly unlikely that the emergency department would have an external psychiatrist that they could call in. The lack of available psychiatrist to call on may lead to ED physicians attempting to provide the best care possible for patients but ultimately not feeling completely qualified to make appropriate care determinations. According to one of the experts we talked with, this created a situation where patients were then determined to need a transfer to an inpatient psychiatric bed in a state psychiatric facility. However, since there hospitals did not have psychiatrists they could call on, the box in the process flow diagram that reads “patient in ED waiting for transport to inpatient psych bed”, is meant to represent the time a patient spends in the ED waiting to be transferred to a facility where they can be evaluated by a psychiatrist. In cases where patients have an involuntary commitment order, they cannot be discharged until a physician feels that the patient is well enough. If ED physicians do not feel comfortable clearing patients, they would likely send them to the inpatient facility also. For patients not needing a psychiatric consult, they would move through the system like any other patient and would either be discharged, transferred or admitted.

The patient care process with telepsychiatry

With the implementation of NC-STeP, a patient’s experience in the emergency

department starts off similarly but changes at the point where a patient needs a psychiatric consultation. In figure 4, this point is marked by a diamond shape saying “does patient need psych consult?” after which a patient needing a consult would trigger the beginning of the NC-STeP process. Once the ED physician determines that the patient needs a psychiatric consultation, they transfer to patient’s information to the NC-STeP portal. When that information has been transferred to the portal, the patient usually waits for the psychiatrist to be available. As soon as they are available, the telepsychiatry cart is moved into the patient’s room. At that point the psychiatric consult begins and usually lasts for about 30 minutes. Once the consult is completed, the results are sent to the patient’s record using the portal and the ED physician reviews the psychiatrist’s notes. Emergency department physicians usually act based on the consultation notes submitted by the telepsychiatrist but also have the autonomy to not follow through with the psychiatrist’s suggestions. If the psychiatrist determines that the patient needs to be transferred to an inpatient facility and the ED physician agrees, the patient would then be waiting for the availability of an inpatient psychiatric bed which on average could take 4 days (13).

Figure 4. A patient’s flow through an ED with NC-STeP



The major difference between the pre-implementation pathway and the post-implementation pathway can be seen in the model with telepscyhiatry after the ED physician has decided that the patient needs a psychiatric consultation. Patients who arrive at an ED without psychiatric services were taken care of as best as possible and waited to be transferred to a psychiatric facility. This is especially true in cases where patients have an IVC order filed. Since rural communities have such a shortage of mental health professionals and ED physicians do not feel as comfortable providing care for psychiatric needs, patients were usually transferred. In the model shown in figure 2, it lays out the patient experience with telepsychiatry. In instances where there is telepsychiatry, the patient can be seen in a timely manner and ED physicians can make a faster determination for the patient. The hope is that this leads to decreased length of stay and an increase in overturned involuntary commitments.

The creation of process flow diagrams is an essential step in understanding systems providing patient care. In the emergency departments participating in NC-STeP, resources and events independent of the program, have an impact on the patient's length of stay and involuntary commitment status. More specifically, length of stay as a measure captures many different steps in the process of caring for a patient like:

the time patients are waiting to be placed in a bed, time it takes for other patients to vacate a bed for incoming patients, number of ED providers available, the time it takes for an inpatient or substance abuse treatment spot to open, and time patients have to wait to be transported to these other facilities. While this list is not exhaustive, it highlights how flawed total length of stay for an ED visit is at measuring NC-STePs impact. With an improved understanding of the key factors that impact the goals of NC-STeP, I analyzed these factors more intently. The following sections elucidate and provide more context for the research questions mentioned above.

How do stakeholders believe telepsychiatry affects the processes of care and outcomes for patients with severe mental illness and/or substance use disorders in rural North Carolina?

The North Carolina Statewide Telepsychiatry claims that as a result of the program patient length of stay in the emergency department has decreased and the number of involuntarily commitments that have been overturned increased. In an article about NC-STeP, the authors stated that "While NC-STeP helps patients see a psychiatrist sooner, it doesn't necessarily mean they will get to a state bed any faster. But for those patients with less complicated cases, seeing a

psychiatrist faster means they can go home sooner if they don't need to be transferred to another facility" (14). This would suggest that NC-STeP may be more efficient at helping ED physicians determine the type of care patients need and how to link them to that care. The program also claims that in helping patients who do not need to be hospitalized receive the care they need, they can readily be connected to community based services that could help patients received ongoing care. This thereby prevents the unnecessary burden on throughput in rural emergency departments, prevents inappropriate hospitalizations and may lessen recidivism. This point is so important because of the impact patient boarding has on the emergency room. One study found that boarding has a negative impact not only on psychiatric patients but on all patients in the emergency department by reducing capacity, resources and increasing pressure on staff (15). Recidivism is more common amongst the SMI/SA population in rural communities as they do not have the same resources available in urban communities. While telepsychiatry appears to have a positive impact, there is also the possibility that in having access to telepsychiatry, ED physicians may become worse at determining care plans for SMI and SA patients. The hospital administrator who provided expert knowledge for this analysis stated that prior to telepsychiatry, ED providers had no choice and had to make the best determinations they could. It is possible that with the new resources at hand, more patients could be sent to inpatient psychiatric facilities than before and providers may be more dependent on telepsychiatry. It is clear that measures of success for the program could also be cause for caution. The

potential effects make assessing the effectiveness of NC-STeP very complicated and raises to question which methods would best assess these components of the programs impact on rural emergency departments.

How well are current data suited for answering this question?

With the creation of the NC-STeP portal, since 2016 they have been able to collect patient level data that provides total length of stay and a breakdown of the time the patient was in the que waiting for services and the time it took for the psychiatric consultation. Unfortunately, this same patient level data are not available for the period before implementation of the program. In an attempt to explore other data options, we talked with data teams that hold the following data sets: NC hospital discharge data, NC-DETECT, and the North Carolina Hospital Association (NCHA) ED Tracker. These data sources had to ruled out because they either did not contain length of stay, involuntary commitment status or they were determined to have significant data gaps. This is problematic in particular for the NCHA data since this source has been used to describe outcomes for SMI/SA patients before telepsychiatry and is used for comparison. In this process, we also learned that of the gaps in the data, commitment status is not a commonly collected measure in ED data sources making it difficult to observe IVC trends over time. Without pre- and post-intervention patient level data that provides a clear breakdown of a patient's ED visit, it is difficult to compare the NC-STeP programs true ability to lower length of stay. There are many

components of an ED visit that can affect the patient's length of stay that may be completely independent of the program and its efficacy. From a broader perspective, there is also a gap in the available data detailing severe mental illness and substance use services and interventions in rural North Carolina communities.

Assessing costs

In addition to data on the potential benefits of the program, it has been very difficult to identify information on the costs associated with the program. Currently, the main pieces of information regarding cost are the funds allocated by the NC General Assembly and the cost savings the program reports. Annually, the NC General Assembly allocates $2 million to support the administration of the program, costs associated with the telepsychiatry carts, and other program operation costs. In what has been named a conservative estimate by NC-STeP administrators, they estimate a "cumulative return on investment to state psychiatric facilities through overturned involuntary commitments of $17,857,800" since program inception (16). This is a fairly impressive amount of saved money for state facilities. However, this figure is not helpful in describing the true costs and potential savings from the program. To truly evaluate the costs of the program, we would need more information on the cost of an emergency department visit where SMI/SA is the primary of secondary reason for the visit, the cost of providing telepsychiatry, the startup costs associated with the

program, and the cost of providing uncompensated care for uninsured or underinsured patients. Other relevant costs would be those related to the spillover effects associated with patient boarding like opportunity cost for the hospital or costs associated with resource waste. Another important consideration when analyzing the costs associated with this program is how reimbursement for face-to-face psychiatric care differs from telepsychiatry. North Carolina is not a full parity reimbursement state; meaning that there is no current law stating that telepsychiatry providers must be reimbursed at the same rate as face-to-face providers. Thus, members of the NC General Assembly proposed a bill on March 8, 2017 called the Telehealth Fairness Act to address payment parity by creating language stating that insurers cannot exclude services provided via telemedicine or reimburse for them at a rate less than in-person services (17). As a result of this proposed bill, the governor signed a bill requiring the Department of Health and Human Services to study and provide recommendations for future policy (18). Other states have been unsuccessful at passing payment parity laws but should this type of legislation pass in the future, it would have an impact on the cost-effectiveness of telehealth interventions like telepsychiatry since the cost of the service would be more than it is today from the payer perspective.

Assumptions and limitations

In the iterative process of creating the process flow diagrams in figures 3 and 4, and through conversations with stakeholders, I identified a few assumptions that needed to be made for simplicity and lack of appropriate data. Assumptions are

common in the modeling creation process but must be addressed to retain the validity of the analysis. The first assumption I had to make in the creation of my diagram can be seen in figure 3. In this diagram, I left out the possibility of there being a local psychiatrist. This decision was made based on conversations with stakeholders that highlighted the high unlikelihood of there being a local psychiatrist that could be called on. Additionally, I made the assumption that ED physicians could stabilize patients but patients needing psychiatric consultations would need to be transferred. This assumption carries large implications when considering patient length of stay and the overall costs associated with the patient's care. Another potential limitation is lack of information about telepsychiatry's sensitivity and specificity. Currently, there is no evidence to suggest that psychiatrists providing care through telepsychiatry would always do a better job determining patient needs in comparison to ED physicians. In future models to understand telepsychiatry, assumptions need to be considered and adapted to ensure the model is the most accurate representation of NC-STeP.

Recommendations and next steps

To continue understanding the intricacies of care provision for severely mentally ill patients and those suffering from substance use disorders, more stakeholders need to be engaged. Through stakeholder engagement from rural hospitals, representatives of psychiatric care facilities, NC-STeP administrators, rural providers, mental health practitioners, and law enforcement, we can create a more representative model highlighting the impacts on costs and benefits NC-STeP has from the government and societal perspectives. With ongoing

engagement from stakeholders, the next step could be to try to encourage data sharing from hospitals that do not participate in NC-STeP or to try to obtain data that would provide a clear picture of the outcomes associated with care provided in rural hospitals in the absence of telepsychiatry. Another option could be to collect data from sites considering joining prior to the initiation of NC-STeP in that hospital. This would improve the gap in data between pre- and - post implementation figures. To better understand the question of increased efficiency, decreased length of stay increased patient throughput, utilization of emergency department resources, and impacts to patient care, we can use the process flow diagrams I created along with improved data, to build models to simulate queuing and flow in the emergency department. Another recommendation to continue the assessment of this program would be to conduct more research and data collection on the societal costs associated with caring for patients with severe mental illness and substance use disorders. Below I have included a table of entities that are impacted by the outcomes of this program and potential costs savings that require further analysis. Based on the entities affected by this program, it is clear that telepsychiatry has a ripple effect that is currently not measurable without take some of the steps mentioned above.

Entity	Cost Savings
Patients & Families	How do you measure distress, disability, functional improvement, quality of life, gainful employment, family financial impact, and wellbeing of family members?
Communities	How do you quantify crime reduction, reduced homelessness, more self-reliance, and better “citizenship”?
Medicaid	How do you quantify projected cost savings from “indigent care” and reduced recidivism?

Third party payers	How do you quantify costs associated with reduced inpatient stays and reduced ED recidivism?
Hospitals	How do you quantify the cost savings associated with improved throughput and ED efficiency?
Law enforcement	How do you quantify cost savings from reduced need for responses to calls with dangerous persons, costs associated with sitting patients, and transporting patients?
*Adapted from a table on cost savings made my Saeed, S.A.	

Conclusion

The North Carolina Statewide Telepsychiatry Program has seen growth and received praise in the years since its implementation in 2013. Whether the program is cost effective from the government, hospital, or societal perspective is still a question that requires exploration. NC-STeP's potential impacts and costs are complex and difficult to model. However, with the baseline insights within this paper, researchers can begin to gather the data necessary to evaluate the program. One thing that is certain is that the program successfully reaches its goal of trying to ensure that patients who need psychiatric services while experiencing an acute mental health or substance abuse crisis can be seen by a trained psychiatrist. This is no small feat and highlights why further analyses of the costs and benefits of programs like NC-STeP are necessary.

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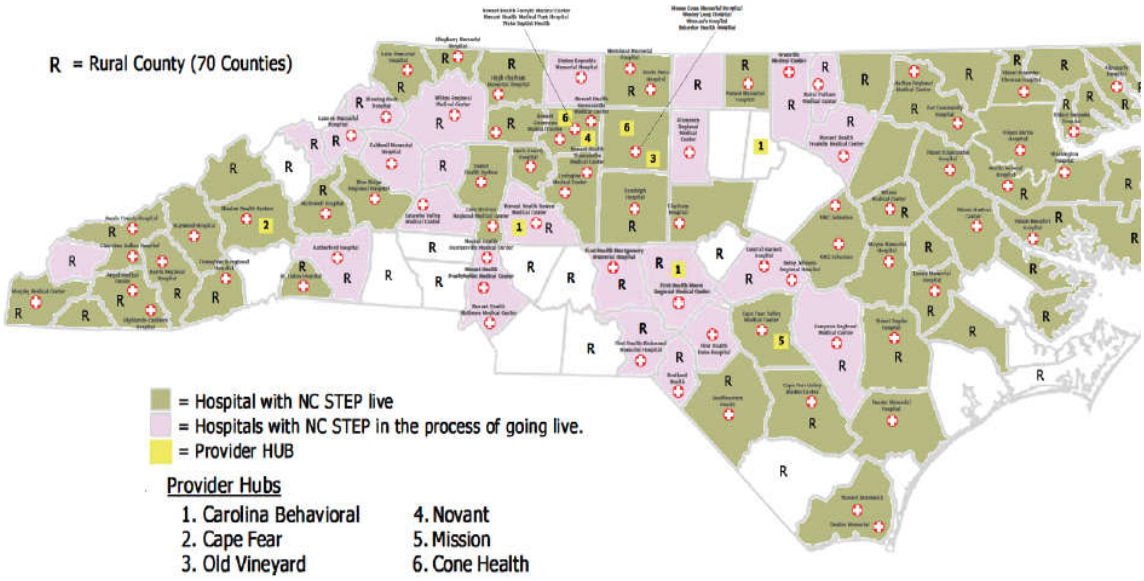
Appendix

Appendix 1. North Carolina Statewide Telepsychiatry Program Service Map - 2017



East Carolina University
CENTER FOR TELEPSYCHIATRY
NC-STeP

Appendix 2. List of hospitals participating in NC-STeP

Vidant Outer Banks Hospital	Cape Fear Valley Bladen Hospital
Vidant Bertie Hospital	Cone Health Behavioral Health Hospital
Vidant Chowan Hospital	Cone Health MedCenter High Point
Vidant Edgecombe Hospital	Forsyth Medical Center
Sentara Albemarle Medical Center	McDowell Hospital
Vidant Beaufort Hospital	Mission Hospital
Vidant Duplin Hospital	Novant Health Clemmons Medical Center
Lenoir Memorial Hospital	Novant Health Kernersville Medical Center
St. Lukes Hospital	Wesley Long Hospital
Wilson Medical Center	Mission Children's Hospital
Morehead Memorial Hospital	Annie Penn Hospital
Harris Regional Medical	Moses H. Cone Memorial Hospital
Swain Community Hospital	Blue Ridge Regional Hospital
Murphy Medical Center	Transylvania Regional Hospital
DLP Maria Parham Medical Center	Women's Hospital- Cone Health
UNC Chatham Hospital	Angel Medical Center
J.Arthur DosherMemorial Hospital	Highlands-Cashiers Hospital
Ashe Memorial Hospital	Novant Health Thomasville Medical Center
Northen Hospital of Surry County	Alamance Regional Medical Center
Southeastern Regional Medical Center	Hugh Chatham Memorial Hospital

Halifax Regional Medical Center	Cape Fear Valley Hoke Hospital
DLP Person Memorial Hospital	UNC Johnston, Clayton
DLP Haywood Regional Medical Center	UNC Johnston, Smithfield
Alleghany Memorial Hospital	Novant Health Presbyterian Hospital
Lake Norman Regional Medical Center	Novant Health Rowan Medical Center
Pender Memorial Hospital	Novant Health Brunswick Medical Center
Cape Fear Valley Medical Center	

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